CHAPTER 5 AIRSPACE REDESIGN

"The modern airplane creates a new geographical dimension. A navigable ocean of air blankets the whole surface of the globe. There are no distant places any longer: the world is small and the world is one."

~ Wendell Wilkie

5 Airspace Redesign

The FAA is reviewing the structure of the nation's airspace and redesigning it to improve throughput and provide user flexibility, consistent with evolving air traffic and avionics technologies. The processes and systems used to manage air traffic are migrating from navigation constrained by ground-based navigation aids to the flexibility of a satellite-based navigation system. The FAA's approach to redesigning the nation's airspace is two-pronged. It is implementing systems and procedures to allow more free flight capabilities in en route high altitude airspace, and at the same time is redesigning the airspace surrounding congested airports to improve traffic flow in and out of the nations busiest airports.

5.1 High Altitude Redesign

Implementation of high-altitude redesign will be evolutionary. It began in the seven northwest en route centers at FL390 and above in 2003, and will expand to additional centers to the south and east over the next several years, with functionality expansions and enhancements planned through 2008 and beyond. With each increment, benefits will increase consistent with user equipage. The focus on high-altitude airspace allows the FAA to begin to implement Free Flight concepts and deploy new technology and procedures in a controlled environment. As a result, properly equipped users will begin to achieve the economic benefits of flying their preferred routes and altitudes with fewer restrictions. Figure 5-1 illustrates the region in which high altitude redesign will first be implemented. Figure 5-2 illustrates the design concepts for the first phase of high-altitude redesign.

Figure 5-1 Initial Implementation of High Altitude Redesigns

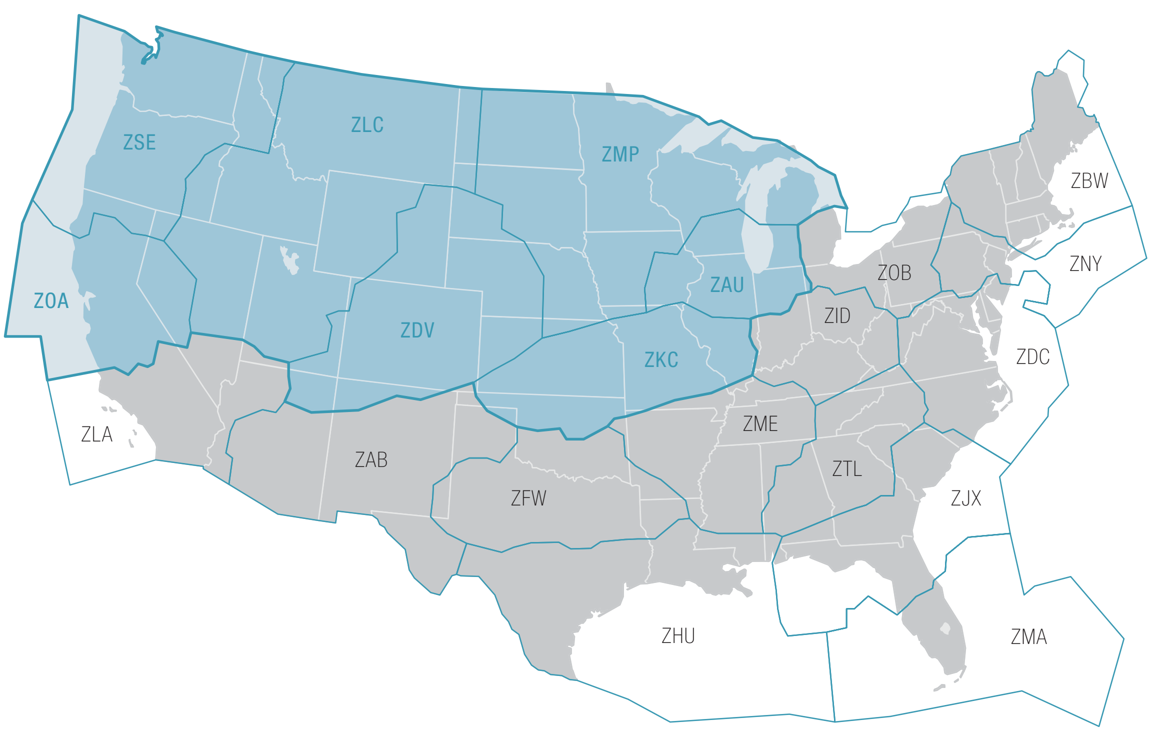
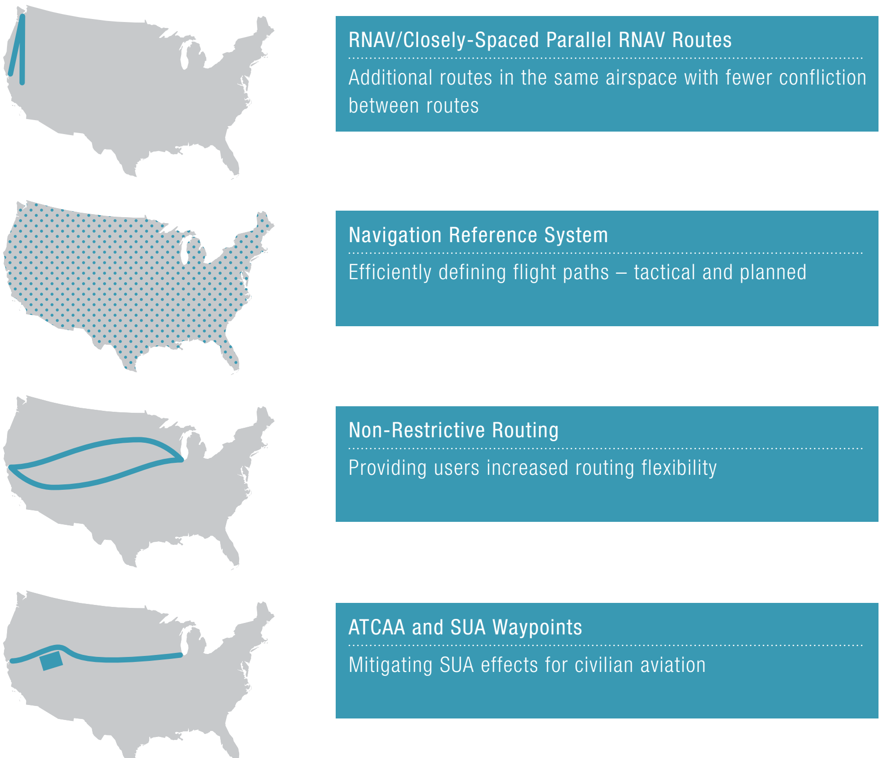


Figure 5-2 High Altitude Airspace Redesign, Phase I Design Concepts



The primary focus of high altitude redesign is to allow point-to-point navigation utilizing both predefined waypoints and a grid of reference points not constrained by ground-based navaids. The predefined waypoints facilitate navigation around Special Use Airspace (SUA), are the basis for RNAV routes and parallel RNAV routes with tracks separated by as little as 8 nautical miles, and allow easy and precise definition of points to and from standard departure and arrival procedures. The points give pilots and controllers the ability to define route segments tactically.

5.1.2 Navigation Reference System Waypoints

The establishment of Navigation Reference System (NRS) waypoints will facilitate RNAV routing and tactical navigation around storm systems and special use airspace by assigning up to 6,500 waypoints over the 48 contiguous states at every ten minutes of latitude and 1 degree of longitude. In the first phase, approximately 600 NRS waypoints will be charted in the seven northwest centers, with approximately 140 of them defined for specific points at which users transition to and from more structured airspace, and along RNAV routes and SUA avoidance routes. Airspace at FL350 and above will be affected. In 2004 the waypoints will be defined for an additional seven centers. The system could be expanded globally, and the International Civil Aviation Authority (ICAO) is considering its application elsewhere. The system will utilize a simple, structured naming convention so the waypoints will be easy to communicate correctly, reducing the likelihood of communication errors. The FAA has begun to chart NRS waypoints, and trials using the NRS waypoints for flight planning began in late 2003. Figure 5-3 illustrates the NRS for the U.S. with waypoints at every 30 minutes of latitude and every two degrees of longitude. Figure 5-4 illustrates how the NRS waypoints will allow users to efficiently circumvent storm systems.

Figure 5-3 Navigation Reference System

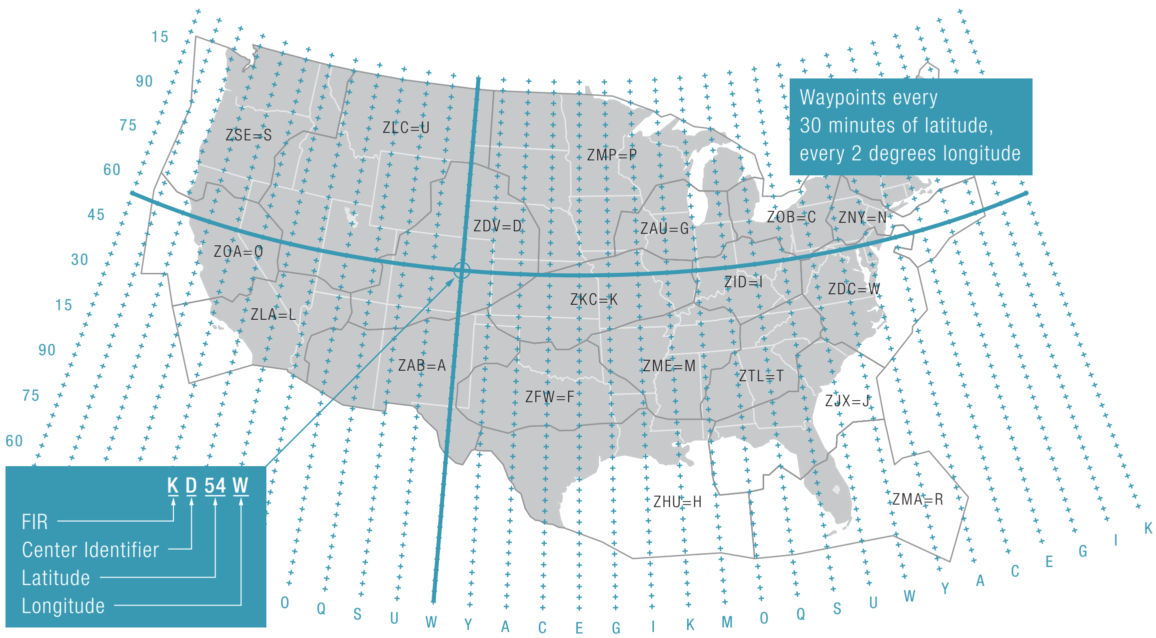
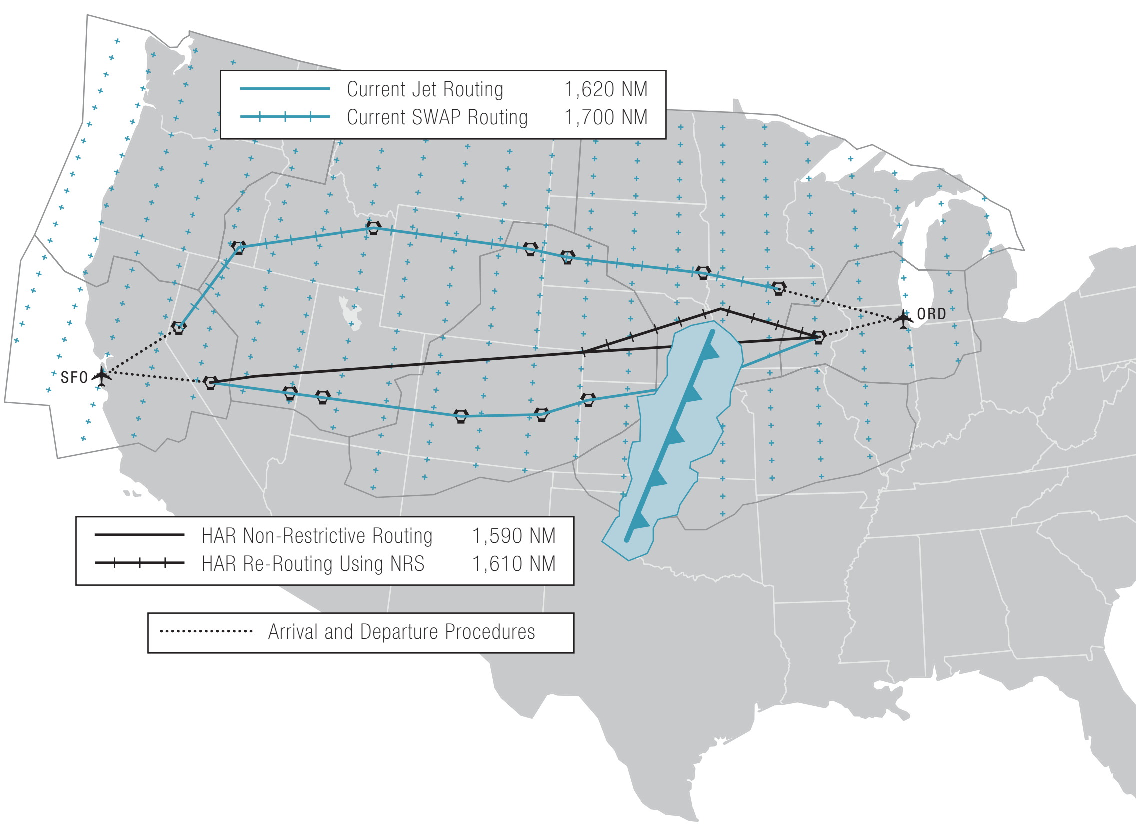


Figure 5-4 Weather Reroute with NRS



5.1.2.1 Waypoints for Navigating Around Special Use Airspace

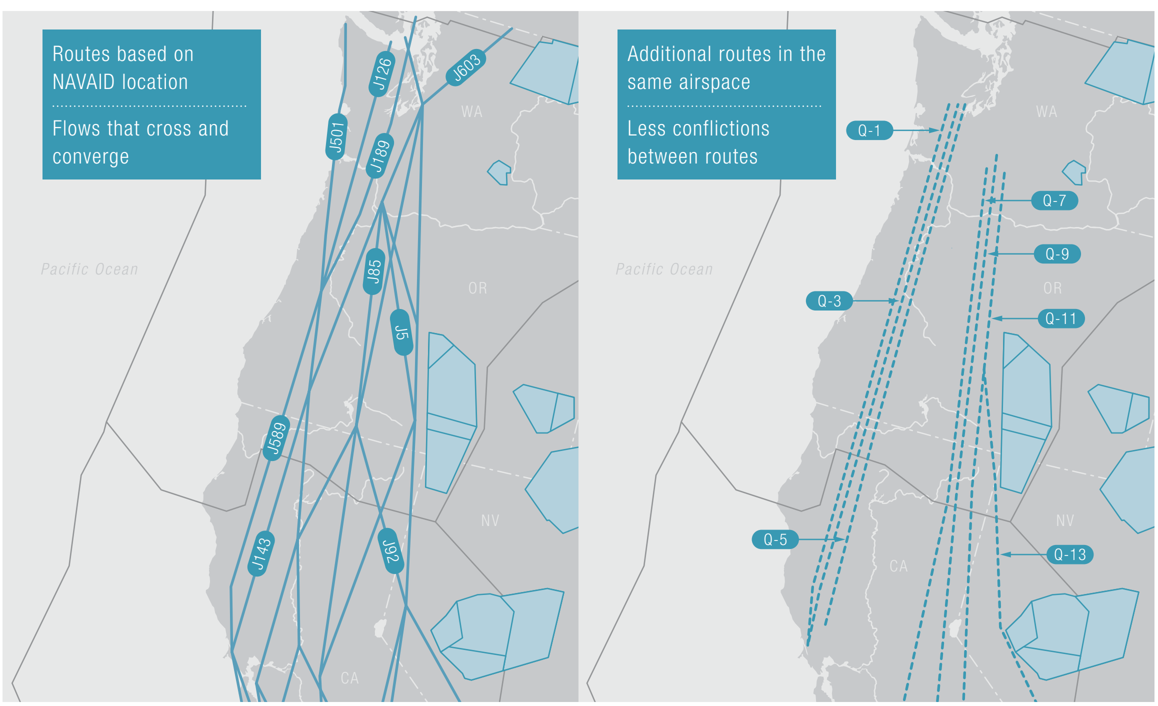
SUA scheduling tends to be in large time blocks, but the airspace may become available for civil use during portions of the scheduled time. To help users gain access to information regarding airspace availability, the FAA has developed a website that provides a 24-hour advance schedule of special use airspace availability for pilots to use for flight planning purposes at http://sua.faa.gov. The site contains waypoints associated with each piece of special use airspace, and provides the ability to filter the data by altitude. Access to the website and the waypoints will assist users in flight planning around restricted airspace.

5.1.3 High Altitude RNAV Routes

The use of RNAV will facilitate less restrictive routing than is commonly available with navigation via radar vectors, allowing efficient routing around active special use airspace and through high-density corridors. Implementation of parallel RNAV routes will further improve system efficiency, and help to reduce the need for miles-in-trail restrictions in congested areas.

In September 2003, eleven new published RNAV “Q” routes were implemented at FL390 and above. “Q” is the ICAO-assigned designator for a published RNAV route in Canada or the U.S. These new Q routes affect Minneapolis, Seattle, Oakland, and Los Angeles Centers. Several of these routes are spaced more closely than standard airways, allowing additional routes in the same airspace. Eventually the Q routes will be available to any RNAV equipped aircraft, but initially aircraft will need to be equipped with global navigation satellite system (GNSS) equipment. In 2006 the FAA will convert Q routes to RNP-2, and will reduce route spacing where operationally feasible. Figure 5-5 illustrates jet routes in the west coast and the high altitude Q routes in the same region. The graphic shows that routes based on ground based navigational aids are indirect and require flows to cross and converge. The Q routes will allow additional routes in the same airspace, and involve fewer conflictions between routes.

Figure 5-5 Jet Routes and High Altitude Q-Routes on the West Coast



In addition to these high altitude RNAV "Q" routes, RNAV routes with fewer altitude restrictions are also being implemented in various regions of the country. For example, in the Northwest and Western Pacific regions, the FAA has developed many advanced RNAV off-airways direct routes between 19 airports, including Seattle, San Francisco, San Jose, Los Angeles, Las Vegas, Vancouver, and Portland. The routes are available for flight plan filing by all RNAV equipped turbojet aircraft, and are filed and flown regularly by airlines and other users. Users file the appropriate DP to a particular fix, and can fly the RNAV route until the appropriate STAR. Several RNAV routes for RNAV equipped Propeller aircraft have been implemented in those regions as well.

5.2 Terminal Area Airspace Redesign

When airport congestion exacerbates airspace congestion, controllers respond by initiating restrictions such as en route holding of aircraft and miles-in-trail restrictions to moderate the flow of aircraft into terminal areas. In addition, at many airports, flights must funnel through common arrival or departure fixes, which reduces throughput rates due to the large number and types of aircraft with varying performance characteristics using the same airspace.

FAA airspace planners are using various approaches to increase terminal airspace capacity and minimize the need for air traffic restrictions, including resectorization, consolidating and expanding terminal airspace, and developing area navigation routes. Sectorization is the process whereby the FAA divides the airspace into appropriately-sized and -shaped volumes that facilitate safe and orderly traffic flows and provides a manageable level of work for the air traffic controllers assigned to each sector. Consolidating terminal airspace reduces the amount of coordination required to handle arriving and departing aircraft, and expanding it frequently allows controllers to begin to reduce aircraft spacing further out from the airport. The development of RNAV arrival and departure procedures allows more efficient use of constrained terminal airspace, because arrival and departure streams can be closer together than those governed by ground-based navigation aids.

Airspace redesign initiatives in New York/New Jersey/Philadelphia, Baltimore/Washington, and Northern California are described below.

5.2.1 New York/New Jersey/Philadelphia Metropolitan Redesign Project

More passengers and planes fly in and out of the New York/New Jersey/Philadelphia metropolitan area than any other area in the U.S. This area services more than 8,000 flights per day, and more than 99 million passengers per year. Routinely, these airports are among the top 10 delayed airports in the U.S., and complexity and congestion continue to be issues even in spite of the continuing industry traffic downturn. No new runways are planned in the NY metropolitan area for 10-15 years.

The proximity of these airports to one another results in complex pilot/controller and controller/controller coordination and fragmented arrival and departure corridors. In addition, during severe weather the airspace in the entire area can be closed off due to lack of alternate routes.

The FAA is analyzing three alternatives to relieve airspace congestion generated by Newark, Kennedy, LaGuardia, Philadelphia and several regional and general aviation airports. The first two alternatives address traffic in the airspace currently controlled by the New York TRACON, roughly a 50-mile radius around the TRACON. The third alternative addresses traffic flow issues by combining the NY TRACON and en route center, and significantly expanding the airspace under terminal control.

The first alternative would make minor adjustments to the existing route structure. The second alternative, referred to as the Ocean Routing Concept is focused on departure procedures for EWR, but affects JFK and LGA flight procedures as well. Under this concept, Newark departures from the south runways (22L/R) would be routed eastbound over the Atlantic, regardless of their destination. Aircraft would turn back toward their destinations after gaining altitude to reduce the impact of aircraft noise on the underlying communities. Environmental and operational analyses on these two alternatives are expected to be complete in late 2003.

The third alternative is referred to as the Integrated Airspace Alternative, or the NY Integrated Control Complex (NYICC). Under this proposal, the NY TRACON and en route center would be combined. The NYICC would provide terminal, en route, and oceanic air traffic control services, and the terminal airspace within the NYICC would be significantly increased. The expansion of terminal airspace would enable controllers to control more aircraft. Existing secondary surveillance radar coverage throughout the area allows terminal separation standards of three miles between aircraft instead of the en route standard of 5 miles between aircraft. Terminal procedures also allow visual separation and more effective staging of arriving aircraft for landing slots as they become available. Expanding the New York TRACON airspace would reduce the fragmentation of arrival and departure corridors across multiple centers, which currently limits the flexibility to address the dynamic nature of the northeast corridor traffic flows. Bringing portions of en route airspace under terminal control will provide additional airspace to support a more even balance of arrivals among arrival fixes and holding patterns within the TRACON. Capacity benefits would include reduced delays, reduced restrictions, and enhanced operations during severe weather events. A Concept of Operations for this proposal is in the final stages of development. The proposal is also beginning the Investment Analysis process, in accordance with Acquisition Management System guidelines.

5.2.2 Potomac Consolidated TRACON

The Potomac Consolidated TRACON (PCT) opened in 2002, and in 2003 the approach control functions for five area airports were consolidated into the new facility—Washington Dulles International (IAD), Ronald Reagan Washington National (DCA), Baltimore-Washington International (BWI), Andrews Air Force Base (ADW), and Richmond International (RIC) airports. The PCT has continuous radar coverage from south of Richmond, Virginia to north of Philadelphia, Pennsylvania, and from as far west as Cumberland, Maryland and east to Cambridge, Maryland. The FAA developed four alternative airspace structures for taking advantage of the consolidated TRACON airspace. Each of the alternatives entailed a significant redesign of PCT airspace, but required varying degrees of coordination and transfer of control with adjacent facilities. The chosen alternative uses existing transfer points between en route and TRACON airspace, with a new internal airspace design. This approach will help resolve air traffic inefficiencies and better handle growth in aviation demand without excessive delays, but will not significantly affect the airspace structure of ATC facilities adjacent to PCT airspace and, therefore, does not require major changes in inter-facility coordination. This alternative will also have the least noise impact on people residing in the study area. Redesigning the combined airspace will allow arriving aircraft to fly at more fuel-efficient high altitudes longer, and departing aircraft to be cleared to higher altitudes earlier. The consolidated airspace has already yielded benefits, even before implementing the airspace redesign. The number of flights canceled or significantly delayed due to summer thunderstorms was substantially less during the summer of 2003 than in previous years, due to the ease of communication with other controllers working the DC/Baltimore area airspace.

5.2.3 Northern California TRACON

In 2003, the FAA completed the transfer of air traffic control responsibilities from four TRACONs in Northern California—Oakland, Monterey, Sacramento, and Stockton—to the consolidated NCT. The NCT monitors flights in and out of more than 20 airports. The last phase of the consolidation plan consists of transitioning portions of Oakland Center en route airspace to NCT. The transition is expected to be completed by October 2004. Redesign of the Oakland Center airspace prior to releasing any airspace to NCT will ensure a seamless transition between the terminal and en route environments.

The FAA's Office of System Capacity is providing Oakland Center (ZOA) and Northern California TRACON with analytical and technical support in the design of the airspace necessary for incorporating portions of the ZOA airspace into the new NCT facility. Current efforts are focused on analyzing traffic flows for the purposes of evaluating potential resectorization options for the NCT expansion and Oakland Center re-design.